

DEINANDRA BACIGALUPII (COMPOSITAE—MADIINAE), A NEW
TARWEED FROM EASTERN ALAMEDA COUNTY, CALIFORNIA

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ABSTRACT

Deinandra bacigalupii is a new tarweed known from alkaline meadows in the vicinity of Livermore, Alameda County, California. The taxon has been treated as conspecific with *Deinandra* [*Hemizonia*] *increscens*, but represents a separate lineage that is morphologically, ecologically, and geographically distinct. Unlike other members of *Deinandra*, *D. bacigalupii* combines the following morphological characteristics: proximal primary-stem leaves mostly entire or irregularly lobed, distal cauline leaves mostly narrowly linear or lance-linear, ray florets mostly 8 per head, ray corolla limbs 2–4 mm long, anthers yellow, and disc pappi of highly irregular, erose scales <1 mm long or reduced to crowns of minute bristles.

Results of molecular phylogenetic and morphological studies of *Deinandra* Greene *sensu* Baldwin (1999) [= *Hemizonia* DC. sect. *Madiomeris* Nutt. *sensu* Tanowitz (1982) plus “*Fruticosae*” or “*Zonamra*” (see Clausen 1951; Keck 1959)] lead me to conclude that plants from eastern Alameda County, California, treated by Tanowitz (1982) as geographically disjunct members of *Hemizonia increscens* (H. M. Hall ex D. D. Keck) Tanowitz [= *Deinandra increscens* (H. M. Hall ex D. D. Keck) B. G. Baldwin] constitute a distinct lineage. Although morphologically similar to *D. increscens*, the Alameda County plants possess mostly entire or irregularly lobed (rather than pinnatifid) proximal primary-stem leaves, yellow (not dark-purple) anthers, and a shorter, more irregular pappus. Ecologically, the Alameda County plants are somewhat unusual in *Deinandra* for occurring in poorly drained, alkaline habitats more typical of the closely-related genus *Centromadia* Greene [= *Hemizonia* DC. sect. *Centromadia* (Greene) D. D. Keck]. Results of molecular phylogenetic analyses of nuclear rDNA spacer sequences place the Alameda County plants closer to *D. corymbosa* (DC.) B. G. Baldwin than to a lineage comprising representatives of *D. increscens* subsp. *increscens* and *D. increscens* subsp. *villosa* (Tanowitz) B. G. Baldwin (Baldwin unpublished). The chromosome number shared by *D. increscens* and the Alameda County plants ($2n=12$ II), but not shared with *D. corymbosa* ($2n=10$ II), is modal and putatively basal in *Deinandra*. Based on the foregoing morphological, ecological, and phylogenetic considerations, I propose a new species to accommodate the distinctive *Deinandra* populations from eastern Alameda County.

Deinandra bacigalupii B. G. Baldwin, sp. nov. (Fig. 1).—TYPE: USA, California, Alameda County, north of Livermore, junction of Ames Street and Raymond Road, in sandy alkaline soil,

31 Aug 1966, R. F. Hoover 9954 (holotype, UC; isotypes, CAS, OBI, UC).

A *ceteris speciebus Deinandrae* differt caracteribus conjuncte foliis proximalibus plerumque integris vel irregulariter lobatis; foliis caulinis distalibus plerumque anguste linearibus vel lanceolatis-linearibus; floribus radiorum (6–)8(–9), limbis corollarum 2–4 mm longis; antheris flavis; squamis papporum irregulariter erosis <1 mm longis vel pappis coroniformibus setis minutis.

Annual herbs, strongly odorous. *Stems* erect, branched in distal half or to near base (the branches ascending-virgate), tawny or whitish (or purplish), shiny near base, to 4 dm high, sparsely to densely hirsute, minutely stipitate-glandular distally, the glands yellowish or clear. *Leaves* sessile, mostly cauline, evenly distributed, alternate (except in basal rosette), ascending to appressed along stems, usually much longer than internodes; blades of primary-stem leaves narrowly oblanceolate (near base of stem) to linear or lance-linear, ≤ 1 dm long, gradually reduced distally, mostly entire or irregularly lobed, slightly revolute, sparsely hirsute and minutely stipitate-glandular, the glands yellow or clear; blades of branch-stem leaves linear to lance-linear, ≤ 1 cm long on distal branches, slightly revolute, uniformly hirsute and stipitate-glandular. *Capitulescences* loosely corymbiform, the side branches overtopping central branches. *Peduncles* inconspicuous (<length of phyllaries). *Involucre*s often partially hidden by overlapping leaves, hemispheric or somewhat um-shaped, ca. 5(–6) mm diam. *Phyllaries* usually 8, same number as ray florets, lance-attenuate, ca. 5(–6) mm long, herbaceous, each investing abaxial surface of a ray ovary (the free tips < half the length of the whole), weakly keeled, sparsely hirsute and densely glandular. *Ray florets* (6–)8(–9), pistillate, fertile, corollas bright yellow, the tube ca. 2 mm long and densely

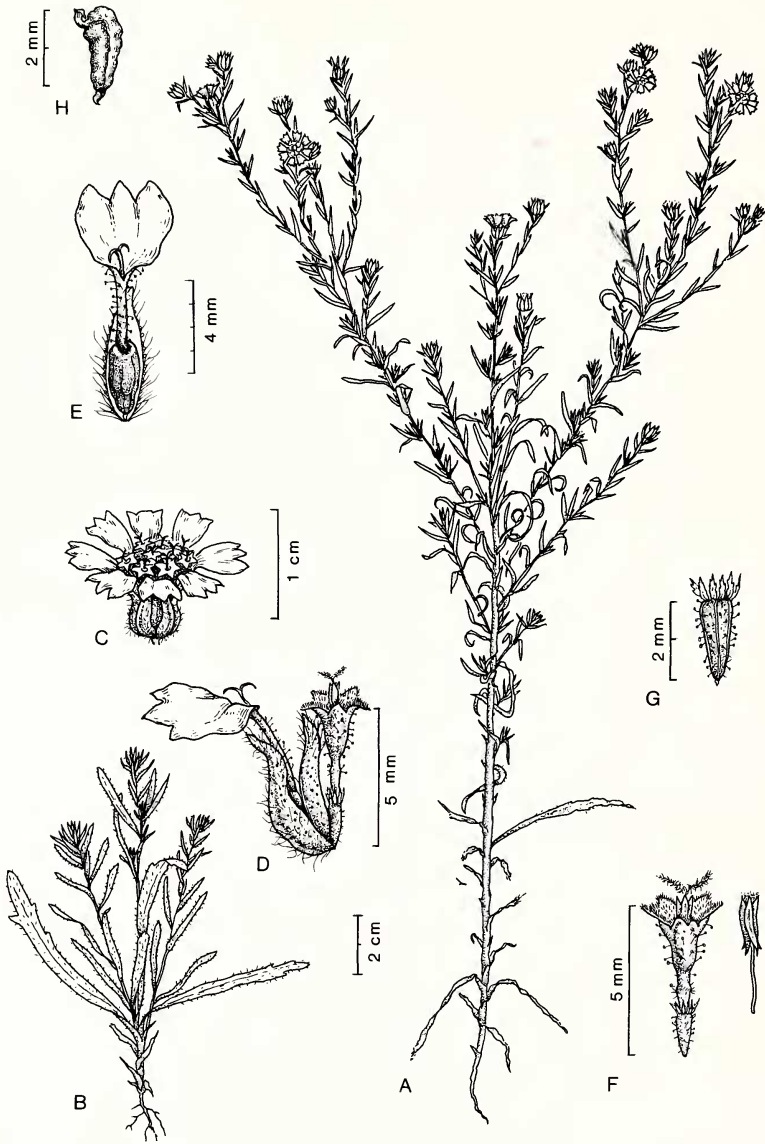


FIG. 1. *Deinandra bacigalupii*. (a) habit of mature plant; (b) habit of immature plant; (c) head; (d) phyllary, ray floret, palea, and disc floret (left to right); (e) adaxial view of ray floret and associated phyllary; (f) disc floret and stamens (left to right); (g) disc ovary and pappus; (h) ray cypsela.

stipitate-glandular, the lamina broadly obovate, 2–4 mm long, 2–3 mm wide, glandular abaxially, shallowly 3-lobed, the central lobe narrower than the lateral lobes. *Disc florets* (10–)15–18(–21), functionally staminate, ca. 5 mm long, corollas bright yellow, the tubes much shorter than the narrowly funnellform throats, glandular, 5-lobed, the lobes densely bristly along adaxial margins. *Anthers* yellow. *Style branches* hispidulous. *Disc ovaries* narrowly clavate, glandular. *Receptacles* flat or slightly convex, glabrous. *Paleae* ca. 8–11, in one peripheral series, connate in basal half, similar to phyllaries. *Cypselae* black, gibbous, obovoid, somewhat 4-angled, ca. 2–2.5 mm long, rugose,

with prominent beaks and short basal stipes, glabrous. *Ray pappi* none. *Disc pappi* of basally connate, whitish to tawny, highly irregular, quadrate to subulate, shallowly to deeply erose scales, <1 mm long, or reduced to crowns of minute bristles. *Chromosome number* $2n=12$ II (reported here from *B. G. Baldwin 1053* [JEPS] and [fide annotation by Dale E. Johnson] from *D. E. Johnson 231* with *J. E. Eckenwalder* [UCSB]).

Paratypes. USA, California: Alameda County, Livermore Valley, Raymond Road and Ames Street, 29 Aug 1969, *R. F. Hoover 11564* (CAS, OBI, UC); just SW of intersection of Raymond

Road and Ames Street, 19 Aug 1976, *D. E. Johnson* 231 with *J. E. Eckenwalder* (UC, UCSB); *loc. cit.*, 2 Jun 1999, *B. G. Baldwin* 1078 (JEPS); 0.1 to 0.15 miles south of junction with Las Positas Road along the east edge of N. Greenville Road, 30 Jul 1996, *R. E. Preston* 989 (DAV); *loc. cit.*, 5 Aug 1997, *R. E. Preston* 1047 (JEPS); *loc. cit.*, 8 Oct 1998, *B. G. Baldwin* 1053 (JEPS); *loc. cit.*, 2 Jun 1999, *B. G. Baldwin* 1077 (JEPS); *loc. cit.*, 14 Jul 1999, *B. G. Baldwin* 1082 (JEPS).

Distribution, habitat, and phenology. *Deinandra bacigalupii* appears to be narrowly endemic to the eastern San Francisco Bay region, near the northern distributional limit of *Deinandra*. The two populations known to me are the type and another (discovered by Robert E. Preston) along N. Greenville Road, Livermore. Both populations occur in poorly-drained, seasonally dry, alkaline meadows, in the vicinity of barren, alkali scalds. Associated species of *D. bacigalupii* include *Allenrolfia occidentalis* (S. Watson) Kuntze, *Atriplex depressa* Jeps. (in adjacent, alkali-scald habitat), *Bromus hordaceus* L., *Centromadia pungens* (Hook. & Am.) Greene, *Cuscuta salina* Engelm. (on *Deinandra bacigalupii*), *Deschampsia danthonioides* (Trin.) Munro, *Distichlis spicata* (L.) Greene, *Frankenia salina* (Molina) I. M. Johnst., *Holocarpha virgata* (A. Gray) D. D. Keck, *Hordeum depressum* (Scribn. & J. G. Sm.) Rydb., *Hordeum marinum* Huds. subsp. *gussoneanum* (Parl.) Anghel & Velican, *Juncus bufonius* L. var. *bufonius*, *Lasthenia californica* DC. ex Lindl., *Linanthus liniflorus* Greene, *Parapholis incurva* (L.) C. E. Hubb., *Spergularia macrotheca* Heynh. var. *longistyla* R. Roszbach, *Trifolium microcephalum* Pursh, *Vulpia bromoides* Gray, *V. microstachys* (Nutt.) Benth. var. *pauciflora* (Beal) Lonard & Gould, and *V. myuros* (L.) C. C. Gmel. *Deinandra bacigalupii* flowers from late spring through early fall (ca. June–October).

No other species that can be easily mistaken for

D. bacigalupii is known from the East Bay region. The paucity of herbarium records of *D. bacigalupii* from an area frequented by generations of plant collectors, including the tarweed specialists Clausen, Keck, and Hiesey, may reflect extreme rarity of the plant. Field work is needed to locate any other populations that may exist. Rapid urban development of the Livermore Valley and surrounding areas may pose a significant threat to continued existence of the species.

Deinandra bacigalupii is named for the late Rimo Bacigalupi, first Curator of the Jepson Herbarium, who annotated the holotype on 26 April 1967 with the following statement: "Does not seem to match any thus far published species of *Hemizonia*".

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